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VITAL STATISTICS.—*A natural population norm.*[1] I. ALFRED J. LOTKA. Communicated by G. K. Burgess.

Birthrate and deathrate are in general functions of the age-distribution in a given population. Hence, for purposes of comparison, it is customary to "correct," the "crude" death rates to correspond to some arbitrarily chosen "standard population."

The age distribution itself is not, however, purely fortuitous, but tends to approach a certain "stable" type, as has been shown by the writer elsewhere.[2]

Instead, therefore, of studying conditions in an arbitrary standard population, it seems worth while to study the characteristics of a "natural population norm," in which the stable age-distribution is actually established. This is the purpose of the present paper. At the same time we shall compare the results obtained for such an "ideal" population norm, with figures actually observed in a case which approaches very nearly the calculated "normal" conditions.

I. *Birthrate, deathrate and age-distribution in life.* As the basis of our present discussion we shall use the formulae developed on a previous occasion, which are as follows.

[1] Paper read before the Philosophical Society of Washington on February 1, 1913.

[2] Am. Jl. Sc. **24**: 199, 375. 1907. Science **26**: 21. 1907. Phil. Mag., p. 435. April 1911. Compare also Bristowe, St. Thomas's Hospital Report, 1876, as quoted in A. Newsholme, Vital Statistics, p. 295. 1899.

$$c(a) = be^{-ra}\,p(a) \tag{1}$$

$$b = \frac{1}{\int_0^\infty e^{-ra}\,p(a)\,da} \tag{2}$$

$$d = -b\int_0^\infty e^{-ra}\,\dot{p}(a)\,da \tag{3}$$

TABLE I

MALES

a_1 a_2	A'_0	A'_1	A'_2	A'_3	A'_4	A'_5	A'_6
0– 5	4.009	9	25	40			
5–10	3.598	28	110	330			
10–15	3.512	44	280	1280	0.01×10^6		
15–20	3.444	60	535	3250	0.02		
20–25	3.344	76	855	6540	0.04	0.02×10^7	
25–35	6.295	188	2860	28170	0.24	0.16	
35–45	5.622	224	4580	59330	0.63	0.53	0.04×10^9
45–55	4.758	238	5900	98670	1.26	1.29	0.11
55–65	3.636	217	6520	128000	1.92	2.33	0.24
65–75	2.217	154	5300	126000	2.20	3.04	0.35
75–∞	0.918	74	3000	78670	1.58	2.62	0.34
$\Sigma A' = A$	41.353	1312	29965	530280	7.90×10^6	9.99×10^7	1.08×10^9

FEMALES

0– 5	4.142	10	25	40			
5–10	3.744	28	115	300			
10–15	3.657	46	295	1300			
15–20	3.585	63	560	3300	0.02×10^6		
20–25	3.483	78	780	6900	0.04		
25–35	6.579	196	2995	30700	0.24	0.02×10^8	
35–45	5.956	230	4760	64300	0.65	0.05	0.04×10^9
45–55	5.203	264	6480	108700	1.37	0.14	0.12
55–65	4.208	252	7560	150700	2.26	0.27	0.28
65–75	2.759	192	6700	154700	2.72	0.38	0.44
75–∞	1.309	108	4200	114700	2.32	0.38	0.52
$\Sigma A' = A$	44.62	1467	34470	635700	9.62×10^6	1.24×10^8	1.40×10^9

In these formulae b is the birthrate per head per annum, d the corresponding deathrate, r is the "natural rate of increase" of the population, i.e., $r = b - d$; $p(a)$ is the probability at birth that a given individual picked at random (at birth) shall reach age a, and is the function tabulated in the so-called life tables, where it is commonly denoted l_x; $\dot{p}(a)$ is the derivative of $p(a)$ with regard to a. Lastly, $c(a)$ is the coefficient of age-distribution, which is

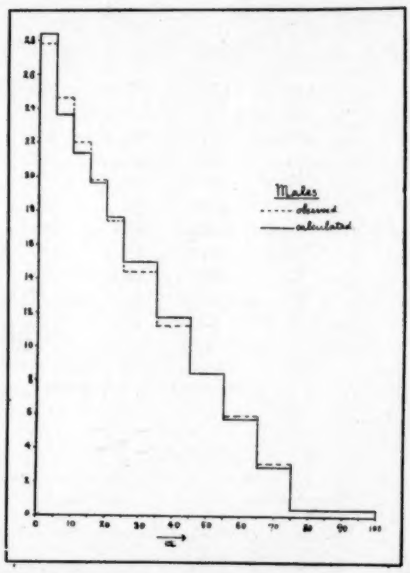

Fig. 1. Age-distribution in the living population, England and Wales 1871–1880. Areas represent numbers of persons. Males.

so defined, that, out of the total number N of the population, the number comprised between the age-limits a and $(a + da)$ is given by $Nc(a)da$.

Now the formulae, as given above, are not in the form best adapted for certain numerical computations. They were therefore developed in series by expanding the exponential function

under the integral sign, and integrating term by term. We thus obtain expressions of the form

$$\frac{1}{b} = A_0 - A_1 r + A_2 r^2 - A_3 r^3 + \cdots \tag{4}$$

TABLE II[3]

AGE—DISTRIBUTION

a_1 a_2	MALES		FEMALES		PERSONS	
	Calculated	Observed	Calculated	Observed	Calculated	Observed
0– 5	142	139	135	132	138	136
5–10	118	123	114	117	116	120
10–15	107	110	104	104	106	107
15–20	98	99	95	95	96	97
20–25	88	87	86	91	87	89
25–35	150	144	148	149	149	147
35–45	117	112	117	115	117	113
45–55	84	84	87	87	86	86
55–65	57	59	63	61	60	59
65–75	29	31	36	35	32	33
75–∞	11	12	13	15	12	13
	1001	1000	998	1001	999	1001

TABLE III

	MALES		FEMALES		PERSONS	
	Calculated	Observed	Calculated	Observed	Calculated	Observed
Birthrate per head : b..	0.03647	0.03692	0.03374	0.03372	0.03508	0.03528
Deathrate per head: d.	0.02216	0.02261	0.02001	0.01999	0.02107	0.02127
Excess : $(b-d) = r$.....	(0.01431)	0.01431	(0.01373)	0.01373	(0.01401)	0.01401
Proportion of females to males.....	1.045	1.055				

[3] The figures given in this table differ somewhat from those published in Phil. Mag., loc. cit.; the latter were computed directly from formula (1), using for r the mean value 0.01401 for the mixed sexes; in computing the results given in the present paper the different values of r for males and females were taken into account, as indicated in Table III.

TABLE IV

b	h	d	r
0.040	0.01582	0.02197	0.01803
0.038	0.01382	0.02205	0.01595
0.036	0.01182	0.02217	0.01383
0.034	0.00982	0.02234	0.01166
0.032	0.00782	0.02256	0.00944
0.030	0.00582	0.02284	0.00716
0.028	0.00382	0.02322	0.00478
0.026	0.00182	0.02368	0.00232
0.024	−0.00018	0.02423	−0.00023
0.020	−0.00418	0.02574	−0.00574
0.016	−0.00818	0.02796	−0.01196
0.012	−0.01218	0.03125	−0.01925
0.008	−0.01618	0.03603	−0.02803

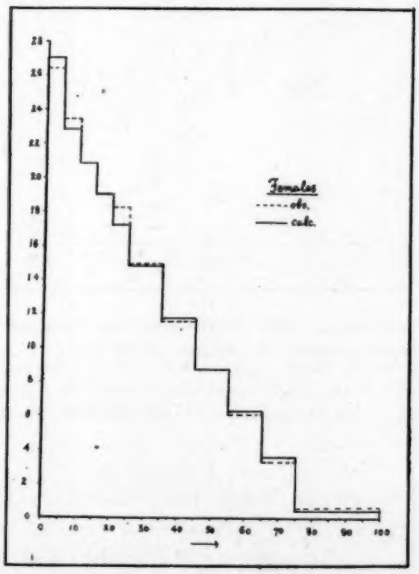

Fig. 2. Age-Distribution in the living population, England and Wales 1871–1880. Areas represent numbers of persons. Females.

and, for the fraction of the population comprised between the ages a_1 and a_2.

$$\int_{a_1}^{a_2} c\,(a)\,da = b\,(A'_0 - A'_1 r + A'_2 r^2 - A'_3 r^3 + \cdots) \qquad (5)$$

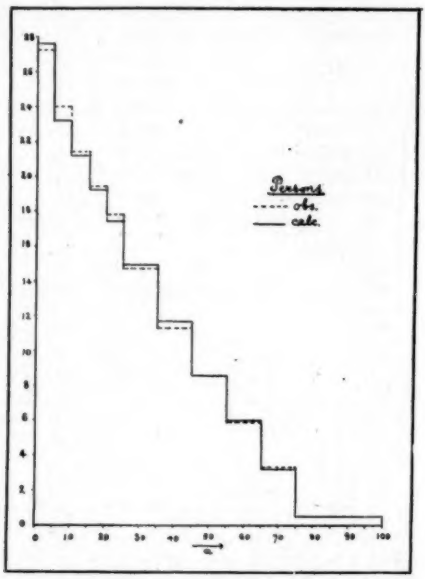

Fig. 3. Age-Distribution in the living population, England and Wales 1871-1880. Areas represent numbers of persons. Both Sexes.

In these series the constant coefficients are given by

$$A_n = \frac{1}{n!}\int_0^\infty a^n\,p\,(a)\,da \qquad (6)$$

$$A'_n = \frac{1}{n!}\int_{a_1}^{a_2} a^n\,p\,(a)\,da \qquad (7)$$

The value of the constants A, A' can be determined in a given numerical example by graphic integration. Using the data given in the Supplement to the Forty-Fifth Annual Report of the Registrar-General of Births, etc., in England, covering the decen-

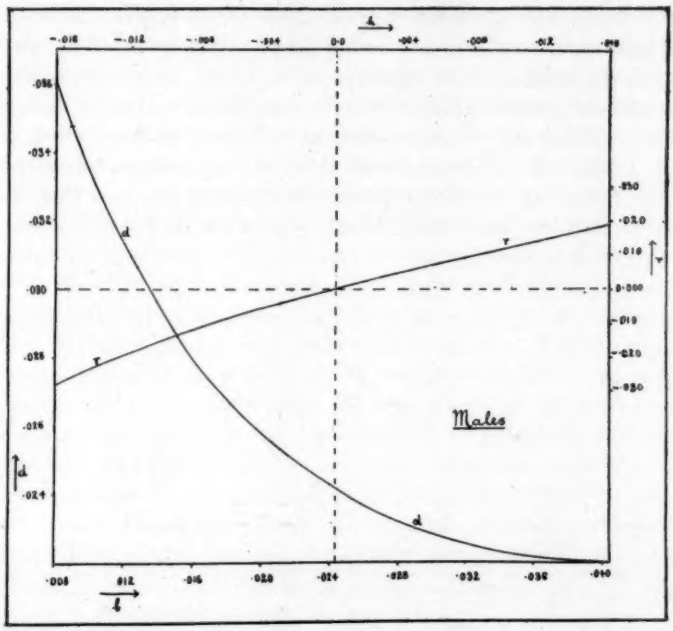

Fig. 4. Relation between birthrate per head b, deathrate per head d and natural rate of increase r in a population with stable age-distribution (on the basis of statistics for England and Wales 1871–1880).

nium 1871–1880, the numerical values shown in Table I were obtained, partly by the aid of the planimeter and partly by application of Simpson's Rule.

Using the values of the constants thus obtained, and substituting for r the observed values, as given in the source cited above,

the results shown in Tables II and III were found. These results are also shown in graphic representation in figures 1, 2 and 3. It will be seen that there is a remarkably close agreement between observed and calculated values.

In order to obtain an idea of the general character of the function defined by equations (2), (4) and Table I, the values of b corresponding to a number of values of r were computed[4] and a curve was plotted. The numbers so obtained are shown in Table IV, and the curve in figure 4, It should be remarked that the portion of the curve corresponding to high negative values of r is of course only of geometrical interest—in nature such a value could only occur under exceptional circumstances, and then only for a limited time, as it would lead, in practise, to the extinction of the species.

[4] To be more precise, the computation was performed by the aid of another series derived from (4). By (4) and Table I we have

$$\frac{1}{b_m} = 41.35 - 1312r + 29960r^2 - 530300r^3 + 7.9 \times 10^6 r^4 - 9.99 \times 10^7 r^5 + 1.08 \times 10^9 r^6 - \ldots$$

This gives

$$b_m = 0.02418 + 0.7673r + 6.823r^2 - 29.32r^3 - 651.3r^4 - \ldots$$

When $r = 0$, $b = b_0 = d_0 = 0.02418$. Putting $h = b - b_0$ and reverting the series by the method given by Prof. J. McMahon (Bull. Am. Math. Soc., April 1894, p. 170; see also C. E. Van Orstrand, Phil. Mag., March, 1910, p. 366) we have:

$$r = 1.3033h - 15.10h^2 + 434.6h^3 - 12590h^4 + 26500h^5 - \ldots$$

and finally, since $r = (b - d)$,

$$d = 0.02418 - 0.3033h + 15.10h^2 - 434.6h^3 + 12590h^4 - 265000h^5 + \ldots$$

The actual computation was carried out by means of this last series. The rapidity of the convergence of the series above is indicated by the number of terms given, which is each case represents an accuracy of four significant figures in the result, when r has a value of about 0.01400.

CHEMISTRY.—*The determination of phosphorus in steels containing vanadium.* J. R. CAIN and F. H. TUTTLE. To appear as a Technologic Paper of the Bureau of Standards. Communicated by W. F. Hillebrand.

In order to precipitate phosphorus quantitatively as phosphomolybdate from steels containing vanadium, it is necessary to reduce the latter to the quadrivalent state, otherwise precipitation is incomplete and there is contamination of the phosphomolybdate by vanadium. In the present method ferrous sulphate in slight excess is used as the reducing agent and the following conditions should be observed: (1) The temperature of precipitation should be held at a point (15° to 20°) where the nitric acid does not oxidize the excess of ferrous salt or the reduced vanadium before complete precipitation of phosphorus takes place; (2) the partial neutralization with ammonia, frequently used when phosphorus is precipitated as phosphomolybdate, must be made before reduction of the vanadic acid, otherwise the heat of neutralization causes the oxidation of most of the ferrous iron and reduced vanadium by the nitric acid: (3) care must be taken to prevent the action of oxides of nitrogen, formed by interaction of ferrous salt and nitric acid, on the reduced vanadium since these substances seem to catalyze the oxidation of the vanadyl salt and may in some cases completely prevent precipitation of phosphorus, owing to the large amount of vanadic acid produced; (4) efficient means for shaking or agitation of the solutions in which precipitation is to take place must be provided.

MINERALOGY.—*The refractive indices of strengite.* WALDEMAR T. SCHALLER, Geological Survey.

The only published values for the refractive indices of strengite, $Fe_2O_3.P_2O_5.4H_2O$, which I have been able to find are those given by Schroeder van der Kolk,[1] namely 1.81 + 0.03; Lacroix[2] has stated them in the form: $\alpha = 1.81$, $\gamma = 1.84$. Determination of these values for a manganese strengite from California[3] gave

[1] Tabellen Mikrosk. Bestimmung d. Mineralien, p. 54, 1906.
[2] Mineralogie de la France **4**: 475, 1910.
[3] This Journal **2**: 145, 1912.

the values: α = 1.70–1.71, γ = 1.72–1.73. Lacroix[4] determined the mean index of similar material (called angelardite by him), as approximately 1.70. It therefore seemed necessary to redetermine the refractive indices of typical strengite in order to bring the conflicting determinations in accord.

Professor Ledroit of Mainz very kindly presented me with several specimens of the mineral from the Eleonore mine on the Dünsberg, near Giessen. The strengite forms small spherulites associated with beraunite (eleonorite), cacoxenite, etc. Crushed fragments of these spherulites were used for determining the minimum and maximum refractive indices. The oil immersion method was used and the values obtained are:

α (normal elongation of fibers) = 1.71
γ (parallel elongation of fibers) = 1.735
$(\gamma - \alpha)$ = 0.025

The values given by Schroeder van der Kolk are therefore wrong and it seems probable that his figure 1.81 was miscopied for 1.71.

[4]Mineralogie de la France **4**: 523, 1910.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. Each of the scientific bureaus in Washington has a representative authorized to forward such material to this journal and abstracts of official publications should be transmitted through the representative of the bureau in which they originate. The abstracts should conform in length and general style to those appearing in this issue.

METALLOGRAPHY.—*Metallographic testing.* Bureau of Standards Circular No. 42, 1913 (in press).

The circular considers metallography in its wider sense and does not restrict it to the microscopical analysis alone. Thermal analysis, together with the correlation of physical properties with microscopical structure, thus find their place here.

The different methods of thermal analysis are briefly reviewed and compared. The importance that is attached to the metallographic method in the iron and steel industry is illustrated by a partial list of the more common applications in that field.

The tests that the Bureau of Standards is equipped at present for carrying out are:

1. *Thermal.* Cooling and heating curves, melting points, heat treatment of alloys as specified.

2. *Microscopical.* Preparation of specimens and photomicrographs of specified magnification up to 1000 diameters (higher magnification by special arrangement), microscopical examination after special heat treatment.

3. *Miscellaneous.* Examination of metals after failure for evidence of the cause of failure, determination of various physical constants of metals and their temperature coefficients. H. S. RAWDON.

BIOLOGICAL CHEMISTRY.—*A biochemical study of the curly-top of sugar beet.* H. H. BUNZEL, U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin 277. 1913.

Oxidase determinations were made on healthy and diseased sugar beets growing under different conditions at Utah in the summer of 1911. The experiments were carried out on the roots, leaves, and other parts of the plants separately, according to the method described in Bulletin

238 of the Bureau of Plant Industry. The determinations show that the oxidase content of the leaves is abnormally high wherever the growth of the plants has been retarded, whether such retardation of growth is due to the curly-top disease, to excessive watering, to drought, or to unknown abnormal conditions of plant growth. Studies made on the distribution of the oxidases of different parts of the plant show that the seeds are highest in oxidase content, the leaves follow, the roots are almost as active as the leaves, while the stems show a lesser activity.

Determinations of moisture, total nitrogen, ash, and sugar in the alcohol-soluble and alcohol-insoluble fractions of the roots and leaves show no differences between the healthy and diseased material. It is suggested that indications point toward the diseased plants being in a state analagous to "fever." H. H. B.

BIOLOGICAL CHEMISTRY.—*Biochemical factors in soils.* M. X. SULLIVAN. Bureau of Soils. Eighth International Congress of Applied Chemistry, **15**: 305. 1912.

The soil possesses oxidizing and catalyzing powers which are stronger in the more productive soils and are more manifest in soils than in subsoils. There are evidences of enzyme action in soils but as yet no good method has been obtained for extracting enzymes from soil. Many of the substances found in soil undoubtedly arise to a considerable degree as a result of the metabolism of microorganisms. In mold cultures have been found fatty acids, especially oleic and palmitic, purine bases, such as guanine, adenine and hypoxathine, histidine and probably thymine. In the solution in which molds have grown were found fatty bodies, guanine, adenine, hypoxathine, histidine, and probably thymine. M. X. S.

AGRICULTURAL CHEMISTRY.—*Normal and abnormal constituents of soil organic matter.* E. C. LATHROP. Eighth International Congress of Applied Chemistry, **15**; 147–151. 1912.

Pentosans, pentose sugars, histidine, xanthine, hypoxanthine, cytosine and possibly creatinine may be considered to be normal soil constituents. Arginine and adenine on account of their infrequent occurrence and their rapid disappearance, and dihydroxystearic acid and picoline carboxylic acid on account of their detrimental action on plant growth, and the striking relation of the former to infertility, must be classed as abnormal soil constituents. Regarding agroceric acid, lignoceric acid, paraffinic acid, and αmono-hydroxystearic acid, agrosterol and hentriacontane no statement is warranted. E. C. L.

AGRICULTURAL CHEMISTRY.—*Effect of histidine and arginine as soil constituents.* J. J. SKINNER. Eighth International Congress of Applied Chemistry, **15**: 253. 1912.

In this article attention is directed to the occurrence and distribution of histidine and arginine in soils. The effect of each on plant growth was tested in nutrient culture solution and both were found to be beneficial. Plants growing in culture solutions containing only potash and phosphate showed greatly increased growth when histidine or arginine is added. When large amounts of nitrate are present in the culture solution, histidine and arginine produce no appreciable effect on the growth. Plants growing in cultures, whether high or low in nitrate, showed a greatly diminished absorption of nitrate when histidine or arginine was present, whereas the removal of potash and phosphate was practically normal. It appears, therefore, that histidine and arginine, like creatinine, creatine, asparagine, and a number of other nitrogenous compounds can replace the effect of nitrate in producing plant growth. J. J. S.

AGRICULTURAL CHEMISTRY.—*Guanine from a heated soil.* E. C. LATHROP. Journal of the American Chemical Society, **34**: 1260. 1912.

In the course of an investigation on the chemical changes in soil organic matter brought about by heating soil in an antoclave for three hours at 30 pounds pressure, guanine was isolated and identified. The guanine was not found in the unheated soil and arises from the breaking down by heat of higher forms of nitrogenous material, probably nucleic acid. E. C. L.

AGRICULTURAL CHEMISTRY.—*Influence of phosphate on the toxic action of cumarin.* J. J. SKINNER. Botanical Gazette, **54**: 245. 1912.

The toxic action of cumarin to wheat seedlings, and the action of phosphates in ameliorating the toxicity, was studied by growing the plants in nutrient culture solutions. It was found that calcium acid phosphate, mono-sodium phosphate, di-sodium phosphate and tri-sodium phosphate, had a similar effect in overcoming the harmful effect of the cumarin. Calcium and sodium phosphate, the latter under different conditions, acid, neutral and alkaline, had the same effect. The effect of the phosphate salts in ameliorating the harmful action of cumarin is due, therefore, to the phosphate radical, and not to the calcium or sodium or to an acid or alkaline condition. J. J. S.

AGRICULTURAL CHEMISTRY.—*City street sweepings as a fertilizer.* J. J. SKINNER and J. H. BEATTIE. Circular of the Bureau of soils, No. 66. 1912.

Several samples of street sweepings from one of the large cities were analyzed and found to contain slightly less phosphate, nitrate and potash than the average stable manure. The effect of the sweepings on growth was tested, by growing corn, wheat and cabbage in paraffined wire pats. The street sweepings produced increased growth, but were not as effective as stable manure. The sweepings were analyzed for mineral oil and some of the samples contained as much as 2 per cent. The oil isolated from the sweepings was tested and found to be harmful to growth. After the oil had been extracted, the street sweepings were as efficient in producing growth as stable manure. J. J. S.

AGRICULTURAL CHEMISTRY.—*Lawn soils and lawns.* OSWALD SCHREINER, J. J. SKINNER, L. C. CORBETT and F. L. MULFORD. Farmers' Bulletin, U. S. Department of Agriculture, No. 494. 1912.

In this bulletin is presented the character of soils in respect to their suitability for lawn making. The texture of soils as related to lawns is emphasized. The soils suitable for the building of lawns, parks, parked embankments, terraces, etc., receive special consideration; also the best methods for building up artificial grounds by the hauling in of such suitable soil material, both for subsoil fillings and for surface layering. A list of soil types well adapted to grass growing is included.

The establishment, fertilization and maintenance of lawns are considered and suggestions given as to the selection of seeds adapted to lawn making. A chapter on the relation of walks, drives, trees and shrubs to the lawn is included. J. J. S.

AGRICULTURAL CHEMISTRY.—*Beneficial effect of creatinine and creatine on growth.* J. J. SKINNER. Botanical Gazette, **54**: 152. 1912.

Creatinine and creatine are both beneficial to plant growth. Plants growing in culture solutions containing only potash and phosphate show increased growth when creatinine or creatine is added. When large amounts of nitrates are present in the solution, creatinine and creatine produce no appreciable effect on the growth. In the presence of these compounds the plants absorb less nitrate, while the absorption of potash and phosphate is normal. It appears that creatinine and creatine can replace nitrate in solution cultures. J. J. S.

AGRICULTURAL CHEMISTRY.—*Effect of asparagin on absorption and growth in wheat.* J. J. SKINNER and J. H. BEATTIE. Bulletin Torrey Botanical Club, **39**: 429. 1912.

Wheat seedlings were grown in nutrient solutions of phosphate, potash, and nitrate in varying proportions and to these were added 50 p.p.m. of asparagin. Asparagine had a beneficial effect on plant growth. When large amounts of nitrate were present in the culture solutions asparagin produced no appreciable effect on growth. The plants absorbed less nitrate from the culture solution while the phosphate and potash absorption was normal. While the effect of the asparagin on plant growth decreased with increasing nitrate, it had nevertheless a conserving effect upon the amount of nitrate left in the solution. It appears therefore that the plant can utilize this nitrogenous compound for plant synthesis. J. J. S.

AGRICULTURAL CHEMISTRY.—*Manganese as a fertilizer.* M. X. SULLIVAN and W. O. ROBINSON. Circular of the Bureau of Soils, No. 75. 1912.

In this circular it is pointed out that fertilizing with manganese has led to varying results. The general conclusion is drawn that in view of the complexity of the soil and the discrepancy that has been found in the use of manganese fertilizers, manganese cannot be recommended in any way other than in experimentation and as a fertilizer complementary to the usual chemical fertilizers, nitrate, phosphoric acid, potash and lime. M. X. S.

AGRICULTURAL CHEMISTRY.—*Studies in soil catalysis.* M. X. SULLIVAN and F. R. REID. Bulletin of the Bureau of Soils, No. 86. 1912.

Soils possess the power to decompose hydrogen peroxide. This power is greater in soil than in subsoils, in strong vital soils than in weak soils. It persists for years in air-dried soils.

Tho good production is not dependent on the catalytic power, the presence of a strong catalytic power in a soil can be taken as *a priori* evidence that the many factors making for soil fertility would be prominent and that the soil would be a productive soil. The catalytic power is checked to some degree by carbon bisulphide, mercuric chloride and especially by hydrocyanic acid, which in some cases practically destroys it. Heating in an autoclave under pressure of 10 atmospheres retards the catalytic power, tho dry heat for one hour at

105° has little depressing action. Various inorganic substances and several organic compounds, especially those in a state of partial oxidation, have the power of decomposing hydrogen peroxide, while several organic compounds increase the catalytic power of manganese dioxide.

In general the catalytic power of soils seems to be due not to an enzyme, such as catalase, but rather to the inorganic and organic matter working separately, conjointly, or in activating combination.

M. X. S.

AGRICULTURAL CHEMISTRY.—*Some organic soil constituents.* E. C. SHOREY. Bulletin of the Bureau of Soils, No. 88. 1912.

The isolation of 15 organic compounds is described, 14 of which have been identified. These together with those previously isolated and described make 35 organic compounds isolated from soils. The substances here described belong to six classes of organic compounds, three of which, aldehydes, organic sulfur, and organic phosphorus compounds are classes not represented among those isolated and described before.

The compounds isolated have been classified as follows: 13 organic acids, 9 organic bases, 3 sugars, 2 aldehydes, 2 alcohols, and 1 each, hydrocarbon, glyceride, resin ester, sulfur compound, phosphorus compound and an acid anhydride. The relationship between these groups as well as that between the isolated compounds and the organic matter in general is discussed. The compounds isolated and described here are oxalic acid, succinic acid, saccharic acid, acrylic acid, lysine, adenine, choline, trimethylamine, salicylic aldehyde, mannite, rhamnose, trithiobenzaldehyde, nucleic acid, of unknown constitution, and an unidentified aldehyde.

The conclusion is reached that the work, like that previously reported, while it emphasizes the complex character of the organic matter of soils, bears out the contention that this complexity is not so great but that the chemical nature of all of the organic matter of soils can be determined by modern methods of research. M. X. SULLIVAN.

AGRICULTURAL CHEMISTRY.—*The chemistry of steam-heated soils.* OSWALD SCHREINER and ELBERT C. LATHROP. Bulletin of the Bureau of Soils, No. 89. 1912.

This bulletin deals with the chemical changes involved when soils are steam heated, as in the process of sterilization. The results may be summarized as follows: (1) In accord with the work of other inves-

tigators it was found that there was an increase in water-soluble constituents and an increase in acidity. At the same time ammonia and amines were formed. (2) By the process of heating there were formed xanthine, hypoxanthine, guanine, cytosine, and arginine, when not previously existing. These compounds are decomposition products of nucleic acid and protein material and are all beneficial to plant growth. (3) Guanine is reported for the first time as a constituent of soil organic matter. (4) Dihydroxystearic acid was increased when present, and produced, when not previously present, by the heating process. This compound is harmful to plant growth. (5) Both beneficial and harmful compounds were produced by heating the soils and were isolated. This bears out the experience of previous investigators with cultural tests. (6) Cultural tests in these soils and their extracts showed that the heated soils gave a poorer plant growth. (7) Although the majority of compounds formed must be classed as beneficial, the harmful compound formed at the same time more than overbalances their effects. Not until this harmful compound is eliminated or diminished can the full beneficial effects of heating be demonstrated. (8) In soils there is a balance of beneficial and harmful factors, soil fertility or infertility being the resultant of the two groups. As one or the other group of factors gains the ascendency, the fertility is raised or lowered, as the case may be. This balance is influenced by cultural treatment, fertilizers, liming, crop growth, or crop rotation, etc., as well as by steaming. (9) The results show that altho the soils studied have received the same kind of organic matter and have received the same form treatment, they have been subject to different biochemical factors, resulting in differences in their organic matter and in differences in their fertility. E. C. L.

INDUSTRIAL CHEMISTRY.—*The effect of certain pigments on linseed oil with a note on manganese content of raw linseed oil.* E. W. Boughton. Circular of the Bureau of Chemistry No. 111. 1913.

Raw linseed oil was mixed with different pigments so that the paint thus prepared had a consistency similar to that of ordinary mixed paint, ready for use. The containers were air tight and the paints were kept for two years. Samples of the oil from each paint were withdrawn at the end of one and of two years, and the constants thereof determined. The raw oil had a specific gravity of 0.934 (15.6/15/6°C.). The greatest increase (to 0.940) was caused by white lead (basic carbonate). Flake graphite, zinc oxide and zinc chromate had no appreciable effect.

The iodine number of the raw oil was 179.6. The greatest decrease (to 171.6) was caused by kaolin. Flake graphite, artificial graphite, zinc chromate, zinc oxide, and chromium oxide had practically no effect, and basic carbonate of lead, Indian red, magnetic black, and lead chromate had but a very slight effect. The percentage of ash in the raw oil (0.13 per cent) was raised to 0.40 per cent by the basic carbonate of lead. The increases due to the other pigments were but slight. Basic carbonate of lead, kaolin, and lead chromate bleached the oil. The results as a whole show surprisingly small changes due to the pigments. At the end of two years the results obtained were practically the same as those obtained at the end of one year. In no case was the iodine number lowered to a figure below that given by pure raw oil from South American seed (171). The percentage of manganese in sixteen samples of raw linseed oil of known purity and source varied from a faint trace (less than 0.0002 per cent) to 0.0008 per cent.

E. W. B.

GEOLOGY.—*The Eagle River region, southeastern Alaska.* ADOLF KNOPF. Bulletin U. S. Geological Survey No. 502. Pp. 61, with maps, sections, and illustrations. 1912.

The Eagle River region, includes the northern portion of the Juneau gold belt, extending northwestward from Salmon Creek, near Juneau, to Berners Bay. This strip of territory is 32 miles long and embraces approximately a third of the entire length of the gold belt.

The rocks are arranged in belts that strike parallel to the general trend of the gold belt and dip steeply northeast. The general parallelism of stratification, cleavage, schistosity, gneissic foliation, dikes, and ore bodies is the salient geologic feature of the region.

The larger part of the gold belt is underlain by an interstratified series of slates and graywackes, with some conglomerates. This assemblage of sedimentary rocks, together with intercalated masses of volcanic rocks, has been named the Berners formation. Fossil plants, consisting chiefly of ferns, indicate that it is of Jurassic or Lower Cretaceous age.

The volcanic rocks, associated with the slates and graywackes consist of lavas, flow breccias, tuffs and coarse breccias, conglomerates, and various kinds of mixed rocks. The clastic material far exceeds the massive rock in bulk. The lavas are in many places extremely amygdaloidal and locally display a striking ellipsoidal structure. They are characterized by the widespread prevalence of numerous well-formed and well-preserved phenocrysts of augite embedded in a dense-grained matrix of

dark blue-green color, and to signalize this feature they are termed augite melaphyres.

Toward the northeast the slates and graywackes pass gradually into phyllites and schists, which become progressively more and more crystalline toward the diorite gneiss that forms the northeast boundary of the gold belt. The schists where they adjoin the gneiss are garnetiferous, staurolitic, cyanitic, and coarsely biotitic.

The gneiss on the northeast, which in local usage is known as the granite hanging wall of the Juneau gold belt, is the crushed and foliated margin of the great intrusive quartz diorite core of the Coast Range. The gneissic structure is best developed near the contact with the schist and fades out northeastward into the ordinary structure of normal granitic rocks. It is essentially a cataclastic effect which was produced by the crushing of the component minerals of the quartz diorite, and which was impressed on the diorite soon after the diorite had consolidated from fusion. In fact, a period of dynamic deformation set in during the pegmatitic stage, for some of the pegmatite and aplite dikes are sheared like the gneiss, but others have escaped the general dynamic metamorphism. The sedimentary rocks adjoining the gneiss have recrystallized into schists, whose crystallinity, as already stated, diminishes gradually from the contact. The region thus affords a remarkably fine illustration of a belt of highly crystalline schists formed as an effect of the heat and pressure accompanying a great batholithic intrusion of late Mesozoic age.

The ore bodies are exclusively gold deposits. The great majority are stringer lodes, but include some mineralized dikes and a few fissure veins. Except for sporadic sheets of rich ore, the stringer lodes are of low grade. They range in width from a few feet to 100 feet, and apparently at a few prospects, to 300 to 400 feet. The greatest depth attained by mining anywhere in the district does not exceed 200 feet.

Some of the mineralized dikes are of economic importance; all are of considerable interest because the profound alteration which they have undergone throws light on the character of the solutions that brought in the gold. A common change consisted in a large introduction of soda and the formation of albite, and this albitization is here shown to be a regional feature of the Juneau gold belt. Other changes consisted in the introduction of apatite into the altered wall rocks and the conversion of amphibole into biotite. From these and other features the vein-forming waters are believed to have been hot, ascending solutions of deep-seated origin, probably connected with the intrusion of the diorite magma.

A. K.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE CHEMICAL SOCIETY

(Local Section of the American Chemical Society)

The 222d meeting was held on January 31, 1913, at the Chamber of Commerce. Resolutions upon the death of Prof. J. W. Mallet, prepared by Professor Dunnington of the University of Virginia, were adopted by a rising vote. The following papers were read, all contributed by members of the Bureau of Soils:

Problems in soil fertility: Oswald Schreiner. The essential problem in soil study is that of infertility. Liebig's theory of impoverishment in chemical constituents as a cause of infertility was only temporarily useful, and chemical analysis proved inadequate in predicting fertility. Soil extracts were then found to reflect very closely the degree of fertility of soils, but this fertility did not depend upon the inorganic substances in solution. Finally the cause of infertility was traced to organic poisons in soils. Along with this change in the point of attack have come great changes in the laboratory equipment necessary for soil investigations.

Recent work on the chemical composition of humus: E. C. Shorey. The organic matter extracted from a soil, is separable into two fractions. From the portion of the organic matter soluble in 2 per cent sodium hydroxide about 35 pure organic compounds have been isolated, of which 11 are nitrogenous; 14 of these compounds are acids, and 10 bases. The portion precipitated by acids contains complex resins and other substances not yet separated. The author described 3 new compounds recently separated: (1) meta-oxytoluic acid, of which 5 grams were obtained from 50 pounds of soil; (2) vanillin, in very small quantity; (3) tetra-carbonimide, perhaps an intermediate compound in the oxidation of uric acid to urea.

The origin of certain organic soil constituents: M. X. Sullivan. Certain molds found in soils were separated in cultures, grown in considerable quantities on Rankine's solution, and studied chemically. Fatty acids (such as oleic, stearic, and palmitic), xanthin, hypoxanthine, mannite, thyurine, pentose sugar, and various other compounds were obtained from these molds. Purin bases and fatty acids were also found in the solution in which the molds were grown. The metabolism of molds and bacteria is an important source of the compounds found in humus. Certain compounds come from the disintegration of plant debris.

Discussion: In reply to inquiries, Dr. Sullivan stated that the relation between the quantity of the compounds described and the quantity

of food in the culture solution was not determinable; he considered that the abundance and variety of organic food in a soil rendered the results entirely independent of any consideration of the composition of the culture solution. The molds were grown in the absence of light.

The physiological action of certain organic soil constituents: J. J. SKINNER. Experiments were made on the effect of salicylic aldehyde, an organic soil constituent, upon the growth of wheat seedlings. Very dilute solutions reduced the growth markedly, or killed the plants. The effect is not neutralized by phosphates, nitrates, or potassium compounds. The metabolism of the plants is greatly retarded. Nucleic acid was found beneficial, the more so, the less nitrate was present. The compounds identified in soils have been classified into harmful and beneficial. Guanidin, picoline-carboxylic acid, vanillin, and dihydroxystearic acid are harmful, while nucleic acid, histidine, arginine, creatine, creatinine, etc. are beneficial.

Discussion by Schreiner, Cook, Hunt, Wells, Seidell, Waters, Cameron, Sullivan, and others. The principal points brought out were: The beneficial compounds seem to be absorbed unoxidized. Salicylic aldehyde was first found in soil from a rose garden at Mt. Vernon, where the soil was becoming unsatisfactory. The harmfulness of a compound can not be predicted from its composition or constitution. The experimental solutions all contain oxygen in solution. Lime and means for promoting oxidation act as a remedy for dihydroxystearic acid. Remedies for other poisons have not been worked out. The active poison in a given soil cannot be told from the appearance of plants grown in it. Flocculation of the soil, better drainage and promotion of oxidizing bacteria all aid in the oxidation of dihydroxystearic acid.

Chemical changes in heated soils: E. C. LATHROP. A fertile and infertile soil from the same locality were compared as to the effects produced by heating under 30 pounds steam pressure (135°). The water soluble constituents were increased. Beneficial compounds were formed, but the production of harmful constituents and the destruction of useful bacteria more than offset their effect. The net result was a decrease of fertility in the fertile soil. Dihydroxystearic acid was found before heating in the infertile soil, and after heating in both soils.

Discussion by Schreiner, Sullivan, Sosman, and Cameron.

The 223d meeting was held at the Cosmos Club February 13, 1913. The following papers were read:

Tests for absinthe: E. K. NELSON, of the Division of Drugs, Bureau of Chemistry. The various modifications of Legal's test for the detection of absinthe were found to give uncertain results in cases where the oil of wormwood was proportionately small in amount. By conversion of the ketones, including thujone from wormwood, into semi-carbazones, they can be freed by steam distillation from essential oils, such as anise, cloves, etc. The semi-carbazones are then decomposed with dilute acid, the ketones recovered, and Legal's test applied to the material thus purified. In presence of thujone the test is not only more delicate but the characteristic thujone odor can be detected. (Author's abstract.)

Discussion: Parsons inquired concerning the sharpness of legal definition necessary under the present law against absinthe. The author did not have exact data to furnish on this point.

The analysis of certain Pacific coast kelps: E. H. PARKER and J. R. LINDEMUTH, of the Bureau of Soils. Read by Mr. Parker. Specimens of the two most important kelps of the Pacific coast from an economic standpoint, as found by previous investigators, were collected from different points along the coast and analyzed for potash, soluble salts, nitrogen and iodine. The conclusions are: (1) the average KCl content is high; (2) Apparently no definite relation exists between the different constituents of kelp; (3) The average KCl content of the *Nereocystis luetkeana* is greater than that of the *Macrocystis pyrifera* this is true for kelp from different localities. In each single case, also, the KCl content of the Nereocystis is greater than the average of the Macrocystis; (4) Apparently the northern kelps are richer in KCl than the southern; (5) the iodine content of northern and southern kelps show no conclusive differences.

TABLE OF AVERAGES.

SOURCE	KCL	IOD.	N.
	%	%	%
Freshwater Bay, Washington	27.63		2.14
(Macrocystis)	19.47		
(Nereocystis)	29.54		
Coast between Los Angeles and San Francisco	23.84		2.21
(Macrocystis)	19.20		
(Nereocystis)	31.74		
Coast near San Diego	10.34		1.11
Total average	21.85	0.20	1.93
(Macrocystis)	15.82		
(Nereocystis)	30.50		
Average of all analyses of Pacific Coast kelps	25.16		

(Author's abstract.)

Discussion: In reply to inquiry, the author stated that the soluble ash formed about 3 per cent of the dry plant.

The influence of environment upon the composition of wheat: J. A. LECLERC and P. A. YODER of the Laboratory of Plant Chemistry, Bureau of Chemistry. Read by Dr. Yoder. The composition and physical properties of wheats have been shown by the Bureau of Chemistry to be dependent upon climate rather than upon heredity. The present investigation studied the effect of soils in comparison with climate, by interchange of blocks of soil, 5 feet square and 3 feet deep, between Maryland, Kansas, and California. The experiments have continued thru four years. The size of grain as well as other physical properties seem to depend chiefly upon the locality and very little on the soil. Results

on protein content are similar but there is a possible first-year effect of the soil. Gliadin number was very nearly the same in all. Other organic constituents varied irregularly. A more marked effect of soil is to be expected in the inorganic constituents, but the reverse seems to be true even in this case; for some constituents the effect of locality predominates, for others the data are uniform for all the samples. The effect on yield was not considered.

Discussion. M. X. Sullivan pointed out that varied treatment of the same soil in neighboring fields may cause wide variations in results. He further emphasized that a soil is like a living organism, and when transferred from one locality to another will itself change radically. Soil cannot therefore be considered a constant factor in comparative experiments such as these. Berger suggested that transfusion from the surrounding soil might rapidly affect the small blocks which were transferred, since they were not cut off entirely from surrounding soil. Cameron suggested that it is really the subsoil below 3 feet that contributes the soil solutions that feed the plant, and that this is the true explanation of the results obtained. LeClerc stated that the variations found in composition are much larger between localities than are ever found between differently treated samples of soil in a given locality. Franklin and Waters adduced other examples of the effect of environment as prevailing markedly over heredity. Yoder and Sullivan came to essential agreement that these experiments do not show how climate exerts its influence, and that the possibility is not excluded that the climate may react upon the soil in a way to influence the characteristics of the crop, thus exerting its effect in a measure thru the soil. Sosman, Cook, Tassin, and others also discussed the paper.

Hydrogenation with colloidal palladium as catalyzer: A. R. ALBRIGHT, of the Division of Foods, Bureau of Chemistry. The great advantage of the palladium hydrogenation method lies in the low temperature and simple apparatus necessary. It has been found possible to attach hydrogen to double bonds which have usually been rather inaccessible to reduction. Many detailed examples were quoted of these reductions, which it is not possible to discuss in abstract.

The rate of cooling in the green and its influence on the physical properties of annealed metals: WIRT TASSIN. It has been assumed widely that the properties of metal depend upon heat treatment (annealing) and its consequent changes in structure, rather than upon the conditions of casting. Hence the present widespread use of microscopic examination of specimens as a check upon properties. The author showed illustrations of a photomicrographic apparatus which he has developed for the examination of the casting itself. As a concrete example of its use, he showed numerous photomicrographs illustrating the effect of different rates of cooling "in the green," (i.e., in the casting fresh from the mold) both upon the initial properties of iron and steel castings, and upon their properties after the usual processes of annealing. The rate of cooling of the casting was shown to be a very important factor in the ultimate properties of the metal.

ROBERT B. SOSMAN, *Secretary.*

THE BOTANICAL SOCIETY OF WASHINGTON

The 86th regular meeting was held at the Cosmos Club, February 4, 1913.

The following were elected to membership: Prof. R. Kent Beattie, Dr. Charles Brooks, Mr. J. G. Grossenbacher and Dr. Neil E. Stevens.

The following program was presented: MR. T. H. KEARNEY: *Indicator value of natural vegetation in the Tooele Valley, Utah.* The Tooele Valley lies between the Oquirrh and Stansbury ranges and extends to the south shore of Great Salt Lake. It was found that the valley is occupied by some half dozen principal plant associations, each of which is characterized by the presence of one, or, at most, two dominant species of shrubs or perennial herbs. The presence of one or another association was found to be closely indicative of the moisture relations and salt content of the soil. The areas occupied by the different associations are often so sharply defined as to be recognizable at a distance of several miles

The presence of a good stand and growth of sage brush (*Artemisia. tridentata*) is always associated with a soil of rather light texture, very dry during the summer months, free from alkali salts, and with a low water table. This Artemisia association occupies mainly the higher lands of the valley. Descending the valley toward the shore of Great Salt Lake, successive zones are traversed which are occupied by the following associations: (2) *Kochia vestita*, (3) *Atriplex conferlifolia* (Shadscale), (4) *Atriplex confertifolia* and *Sarcobatus vermiculatus* (Greasewood), (5) *Allenrolfea occidentalis*, (6) *Distichlis spicata* (Salt Grass) and two species of Salicornia.

Where associations 2 and 3 occur the soil is very dry during the summer, but has a higher moisture capacity than in the Artemisia association and the sub-soil is strongly saline. Under association 4 the soil becomes saline to the surface and the ground water table is relatively high. Associations 5 and 6 occupy the wet and highly saline soils near the level of the water surface of the lake and are interrupted by bare expanses covered with a crust of salts (chiefly sodium chloride).

The suitability for crop production of the different types of land in this valley can be predicted with much confidence from the character of the native growth.

MR. HARRY B. SHAW: *The control of seed production in beets.* Practically all sugar-beets seed used in the United States is imported. Successful attempts have been made in Utah, Idaho and Washington States to produce sugar beet seed, but in other regions such attempts have not been very successful, inasmuch as many of the plants have failed to mature seed. Observations were made to ascertain the cause of this. In order to make the subject readily comprehensible attention was invited to the surprising responsiveness of the beet to environment

In these varied manifestations was sought a common factor, or group of factors, which acting at a critical period in the life of the plant, might be found to control the manner of its development. Experiments were carried on in Utah during 1912 to determine, if possible, the nature of the conditions responsible for the variations mentioned.

It was discovered that the condition absolutely necessary for the perfect development of the reproductive parts is a period of restrained growth in the bud rediments of seedlings, or the buds in the crown of so-called mother beets. While in general this condition is brought about by low temperatures (a mean temperature of 38 to 45°F. apparently being required for the sugar beet) when prevailing for several weeks, the necessary degree of growth inhibition may be brought about by other factors, such as pathological conditions, drouth, starvation. The withdrawal of such a period of inhibited metabolism, according to degree, will result in the greater or less degree of approach to foliage conditions, as opposed to the development of reproductive parts.

Thus, by a study of climatic conditions, suitable locations where the production of seed may be assured, can be selected with a considerable degree of certainty. The proper time to plant the mother-beets can also be indicated, so that we may be reasonably certain that the beets will produce seed.

This necessity for a period of inhibited metabolism, and the fact that it may be brought about by the conditions mentioned, may explain the remarkable inflorescence of moribund fruit trees, or of trees that have been girdled, also the abnormal behavior of plants carried from a cool to a warm climate.

The 87th regular meeting was held on February 25, 1913, at the Hotel Cochran. This was the regular annual opening meeting of the Society. Fifty members and forty-two guests were present.

The retiring president, Mr. W. A. ORTON, delivered an address entitled *Environmental influences in the pathology of Solanum tuberosum.* This paper was published in this journal **3**: 180. 1913.

The 88th regular meeting was held on April 1, 1913, at the Cosmos Club.

Mr. James T. Jardine was elected to membership.

The following papers were presented.

Dr. G. G. HEDGCOCK: *Notes on Diseases of Trees Caused by Mistletoes.* Mistletoes are found only on conifers in northern and northeastern United States; only on angiosperms in southeastern and southern portions; and on both in western and southwestern regions, where they are the most widely disseminated. The rate of spread of mistletoes is without doubt very slow. Near Frazer, Colorado, on an old burn in the forest, the rate of spread of *Razoumofskya americana* (Nutt.) Kuntze on the lodge pole pines (*Pinus contorta* Loud.), is estimated to be from 6 to 12 feet per annum, where mechanical expulsion of the seeds aided by winds are the controlling factors. Sporadic infections at much greater distances are caused possibly by birds or animals.

Light is the most important factor in determining the spread of mistletoes of species of both Razoumofskya and Phoradendron. Trees in the open, and in more exposed conditions, whether on ridges or edges of canyons or on level areas are most subject to attack by mistletoes on account of the abundance of light. Mistletoes are stunted by dense

shade, and bear but few, if any seeds, and can not well maintain themselves under such conditions.

One of the immediate effects of the presence of the sinkers of these parasites in the tissues of trees and shrubs, is a tendency to hypertrophy in the immedate region of penetration. In case of species of Phoradendron, unless the mistletoe plant is broken off there is little or no tendency for its lateral sinkers to spread in the tissues of the host, and when broken off, the rate of spread is slow, and no witches brooms are formed. In case of species of Razoumofskya, witches brooms are commonly produced; the lateral sinkers spread in the soft tissues of the host, keeping pace with each year's growth, and sending forth new aerial shoots. The stimulus of the presence of this ramifying network of sinkers of the parasite causes an increase in the number of buds and twigs produced by the limb of the host attached and results in the formation of a more or less dense witches broom. The ability of the mistletoe to grow out to the extremities of the limbs, enables it to send out shoots in the best illuminated portion of the broom, and to bear seeds under the most favorable conditions of light.

All species of mistletoe are considered injurious in their final effect upon trees and shrubs. The leafy Phorandendrons are no doubt less injurious, because of their increased chlorophyll bearing surface and consequent greater ability to manufacture hydrocarbons. The leafless species of Phoradendron are more injurious than the leafy ones. Species of Razoumofskya are most injurious and stunt the growth of the hosts. In view of the slow spread of species of mistletoe in the forest, it will be possible to lessen, if not entirely to shut out these parasites from our future forests, by cutting down all diseased trees on areas where timber sales are conducted.

Prof. A. S. Hitchcock: *Notes on the botany of Trinidad.* Mr. Hitchcock remained on the island of Trinidad from November 25 until December 31 except a few days spent on Tobago. On Trinidad there were collected 350 numbers of grasses representing about 175 species. Grisebach (Fl. Brit. W. Ind.) describes 87 species from the island and Hart (Herb. List, Bot. Dept. Trinidad) lists 112 species. Several species known to grow in Trinidad were not obtained by Mr. Hitchcock but many species were added to the known flora. Among the more interesting regions of the island were: Pitch Lake, where several unique species of grasses were found including *Panicum chloroticum*, growing only in the water-holding depression of the pitch; Aripo and Piarco savannas, isolated low flat grassy openings in the valley of the Caroni river, where were found a probably new species of *Raddia* and *Paspalum serpentinum* Hochst. not found since the original collection by Keppler in Surinam nearly a century ago, and two new species of Panicum; and St. Joseph savanna on the mountain side near the ancient capital of the island, St. Joseph. This savanna is of especial interest because the mountain sides are generally covered with forest except where cleared for cultivation; it has occupied its present position since an indefinitely early period as shown by the flora. The dominant grass is *Trachypogon*

plumosus, a species which has not been reported from Trinidad. This species together with others of the association are the common constituents of the savannas found on the Pacific slope of Panama and Central America. In this savanna was found an undescribed species of Axonopus, a beautiful golden annual, allied to A. aureus. At Tabaquite in the center of the island in the original forest or "High woods" was found another undescribed species of Raddia and the rare *Pharus parvifolius* Nash. Several other apparently undescribed species were found on various parts of the island. Most of the species, whose types were from Trinidad were re-collected at their type localities. The results of the expedition to Trinidad and to Jamaica visited earlier on the same trip, were very satisfactory and will supplement the large West Indian collections previously incorporated in the National Herbarium.

C. L. SHEAR, *Corresponding Secretary.*

THE BIOLOGICAL SOCIETY OF WASHINGTON

The 508th regular meeting was held in the assembly hall of the Cosmos Club February 22, 1913, with President NELSON in the chair and 76 persons present.

The program consisted of a lecture by EDMUND HELLER on *Hunting with Rainey in Africa.* The communication was chiefly descriptive of the maps and numerous lantern slides exhibited and also of the physical features and vegetation of the country, as well as the animals secured during the expedition.

The 509th meeting was held March 8, 1913, with Vice-President PAUL BARTSCH in the chair and 37 persons present.

Under the head of *Brief notes and exhibition of specimens*, WM. PALMER exhibited the head of the small devil ray, *Mobula olfersi*, and a plaster cast made from the same, and explained the feeding habits of this fish. A. C. WEED gave some further account of its habits, and THEODORE GILL added some historical notes about devil fishes. BARTON W. EVERMANN reported results of the sale of blue fox skins from the Pribilof Islands at Lampson's (London) auction on March 7. The 384 skins offered sold at an average price of $56, the highest price being $85.

The regular program consisted of two communications: J. W. GIDLEY gave an account of a fossil camel recently found in America north of the Arctic circle. The only bone found was a phalanx. The species was an extinct one and its occurrence so far north was regarded as further proof that there once existed land connection between the continents by way of Alaska. The paper was discussed by Messrs. WILCOX, O. P. HAY, WEED, GILL, EVERMANN, LYON and others.

The second communication was by PAUL BARTSCH on some *Remarkable Philippine molluska obtained by the U. S. Bureau of Fisheries expedition.* Specimens of the mollusks described were exhibited by the speaker.

The 510th meeting was held March 22, 1913, with Vice-President BARTSCH in the chair and 52 persons present.

BARTON W. EVERMANN reported the executive order of President TAFT made March 3, 1913, setting aside the entire chain of the Aleutian Islands as a wild mammal and bird reservation. The reservation is to be under joint charge of the Departments of Agriculture and of Commerce. A. D. HOPKINS announced the recent organization of a new scientific society, *The Society for the Advancement of Forest Entomology in America.*

The regular program consisted of two communications:

1. *Recent progress in the study and culture of the common eel:* HUGH M. SMITH. This was a comprehensive outline of the recent discoveries concerning the life history of the common eel. Statistics of the commercial uses of the eel and the methods employed abroad for its propagation and distribution were given. Numerous lantern slides were shown.

2. *Tree-shrews:* MARCUS LYON, JR. This paper was based upon a study of many specimens of these squirrel-like, insect-eating animals. Of less than 800 known specimens in museums, the British Museum possesses 355, the U. S. National Museum 324, and about 100 are in other collections. The paper was illustrated by lantern slides. Messrs. BARTSCH and WM. PALMER took part in the discussion.

The 511th meeting was held April 5, 1913, with President NELSON in the chair and 43 persons present.

Under the heading *Brief notes,* PAUL BARTSCH reported observations on the habits of the two common toads of the District of Columbia, *Bufo americanus* and *Bufo fowleri.* HENRY TALBOTT commented on the possible agency of man in the dispersion of animals during the relatively recent geological ages.

The regular program consisted of two communications:

1. *A commercial aspect of paleontology by a layman:* HENRY TALBOTT.

2. *The zoological results of the Denmark expedition to northeast Greenland:* FRITZ JOHANSEN. The speaker, who accompanied the expedition, gave an account of climatic conditions and the fauna and flora encountered. Mammals and birds received the principal attention. Maps and numerous lantern slides were used.

D. E. LANTZ, *Recording Secretary.*

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